RADIATION PROTECTION

RECOGNITION OF THE QUALIFIED EXPERT

A DISCUSSION DOCUMENT

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SUMMARY

This discussion document describes the current practice and legal position in respect of recognition of qualified experts in radiation protection in the UK and other EC Member States, takes account of related activities (the Diploma Directives) and offers three possible options for the future. It does not recommend any particular line of action but seeks comment and proposals from interested parties.

INTRODUCTION

1. Several factors make now a suitable time to reconsider how "qualified experts" (radiation protection advisers and qualified persons in UK terminology) are recognised by the UK competent authority, the Health and Safety Executive (HSE). These factors are: the imminent revision of the Euratom Directive on Basic Safety Standards for Radiation Protection (Ref 1); the consequential revision of the UK domestic legislation (the Ionising Radiations Regulations 1985 (IRR 85)) (Ref 2); and the imminence of the Single European Market, at the end of 1992, which seeks to achieve free movement of goods, people and services across the borders of European Community (EC) Member States.

2. This paper briefly describes the current position and identifies possible changes. It is written with the intent of provoking discussion, identifying any other problem areas or difficulties and inviting comment on the various options.

CURRENT PRACTICE - LEGAL POSITION

3. The notion of a radiation protection adviser or officer was included in guidance documents dating back to the 1960s. The Euratom Directives on Radiation Protection provided the first legal incentive, every version (the current one being 80/836/Euratom, as amended by 84/467), requiring the competent authorities to "recognise the capacity to act as qualified experts" of persons "having the knowledge and training to carry out physical or technical tests or radiochemical tests, or to give advice in order to ensure effective protection of individuals and correct operation of protective installations as the case may be". The Directive then prescribes that certain specified tasks should be performed by, or under the direction of, qualified experts, eg radiological surveillance at the workplace, preparation of working instructions, examination and testing of protective devices and instruments.

4. The Directive requirements have been incorporated into IRR 85 mainly (but see also paragraph 21) by way of Regulation 10, which requires that an employer shall appoint a radiation protection adviser (RPA) for the purpose of advising him/her "as to the observance of these Regulations and as to other health and safety matters in connection with ionising radiations". Detailed guidance on the qualities and attributes required of an RPA, and matters on which RPA advice should be sought, are listed in paragraphs 71 and 75 respectively of the Part I of the Approved Code of Practice (Ref 3) and reproduced in Appendix 1.

5. An employer who wishes to appoint an RPA must notify the local office of the HSE in writing, at least one month prior to the intended date of appointment, giving the prospective RPA's name, qualifications (usually taken to mean academic qualifications) and experience, also the scope of the advice required by the employer. Unless there are obvious reasons for questioning the appointment HSE sends the employer a formal acknowledgement of receipt of the notification. The employer is then free to appoint the person or persons concerned.

6. HSE has so far deliberately refrained from specifying formal criteria for acceptable qualifications, not least to allow the employer maximum flexibility for identifying and appointing suitable people. This system seems to have proved successful to date, though the evidence is perhaps negative rather than positive in that the, relatively few, legal actions against an employer for breach of Regulation 10 have related to failure to appoint an RPA where required, rather than to appointment of under-qualified or inexperienced RPAs.

CURRENT PRACTICE - PROFESSIONAL BODIES

7. Two well established professional bodies active in the area of RPAs are: the Society for Radiological Protection (SRP), which draws its members mainly from the nuclear and general industrial sectors; and the Institute of Physical Sciences in Medicine (IPSM) which represents mainly clinical scientists working in health care. SRP and IPSM have recently agreed to combine their separate certification schemes into one which is designed to provide suitably qualified and experienced members with a certificate of competence to practise and advise on radiation protection, within specified areas.

8. The most serious difficulty seen by SRP and IPSM in administering their joint certification scheme is judging in which

areas of radiation protection an individual is suitably qualified and experienced to work, given the wide diversity of areas in which RPA advice may be needed. It is seen as vital that RPAs should have a thorough knowledge of the work activity they are involved in and that they are able to apply their technical knowledge to best effect. Clearly, the knowledge required of an RPA in nuclear fuel reprocessing is markedly different from that of an RPA working in a radiotherapy department of a hospital, albeit the underlying principles of radiation protection are identical.

9. SRP and IPSM have therefore identified four "fields of work" which are then further subdivided into "areas of competence". Candidates for certification have then to demonstrate to the satisfaction of the relevant Certification Committee that they have the qualifications and experience appropriate to one or more areas of competence. This is generally achieved by means of referees' comments and through personal knowledge of the candidates by members of the Certification Committee. There is provision for candidates to be interviewed and/or seen at their place of work, though it has rarely been invoked. Certificates issued will be endorsed to show the areas of competence which they cover.

10. The areas of competence within the four fields of work are as follows:

Reactors	Power Reactors	A
	Research Reactors	B
Machines, Unsealed and Sealed Sources	Medical (diagnostic)	C
	Medical (therapy)	D
	Industrial	E
	Research	F
	Instrument Calibration	G
Unsealed Sources	Nuclear Industry	H
	Waste and decommissioning	I
Non-ionising Radiation*	Lasers	J
	Microwave and RF	K
	Ultra-violet	L

* There is no legal requirement for RPAs for non-ionising radiation.

11. Some 300 certificates in total have been issued by the two bodies. Certificates are valid for 5 years and may be renewed upon application; a fee (£15 for members, £25 for non-members) is charged for the service. Certificate holders are required to affirm to a Code of Professional Conduct (see appendix 2 for the Code appropriate to SRP).

PRACTICES IN OTHER EC MEMBER STATES

12 Information about the practices in individual Member States is listed in Appendix 3. In summary, there is a wide variation of practice, ranging from the very flexible approach adopted by countries such as UK and Ireland, to the highly structured, examination-based, systems adopted by Netherlands and Germany.

THE DIPLOMA DIRECTIVES

13. The early attempts by the EC to harmonise standards and therefore facilitate the free movement of appropriately qualified persons were aimed at specific professions (e.g. doctors, dentists). However, the need to achieve quicker progress has led to a change of approach whereby all "regulated" professions will be covered by two directives (the "Diploma Directives", see next paragraph): a regulated profession comprises broadly any activity or range of activities for which possession of a recognised diploma, certificate or other evidence of formal minimum qualification is required.

14. The First Diploma Directive, adopted in 1988 (89/48/EEC), addresses professions for which a minimum of 3 years post-school study (equivalent to study at a university) is necessary for the qualification; it has been implemented in the UK by the Department of Trade and Industry by means of the European Communities (Recognition of Professional Qualifications) Regulations 1991. The Second Diploma Directive, as yet unadopted, deals with a lesser standard of post school study; the Employment Department has lead responsibility for this Directive (further information is available from Alison Rose, Employment Department, Room 513, Steel House, Tothill Street, London SW1 H 9NF, tel. 071-273 5400).

15. The Diploma Directives mean that people who hold a qualification specified for a particular job in a regulated profession in their own Member State cannot be rejected for similar jobs in another Member State on the grounds that they are under-qualified. Special safeguard provisions apply in cases

where the move is between two Member States with dissimilar qualification requirements. These provisions allow for any shortfall in length of training to be made good by further professional experience and for any doubts as to the adequacy of the training to be resolved by means of an examination or a period of assessed supervised practice.

16. At present, RPAs in the UK are not regarded as belonging to a regulated profession, on the grounds that there is no requirement for a minimum qualification and that acknowledgement by HSE of the notification of the proposed appointment of an individual does not in itself imply recognition of a minimum qualification.

17. Although there is no EC requirement for qualified experts to be regarded as members of a regulated profession, several Member States take the line that they should be and have specified minimum qualifications in their legislation. This situation, together with the Diploma Directives which facilitate free movement of members of regulated professions, suggests that the UK may have to reconsider their policy on this matter.

THE QUALIFIED EXPERT IN MEDICAL PHYSICS (RADIATION PROTECTION OF THE PATIENT)

18. The term "qualified expert" is also used in the Euratom Directive on Patient Protection (84/466/Euratom) in relation to an expert in radiophysics concerned with radiation protection of patients consistent with their proper treatment and diagnosis. These experts are not necessarily the same as those to which the Basic Safety Standards Directive refers and the Patient Protection Directive does not require the competent authorities to recognise their capacity to act. Nevertheless, the European Federation of Organisations for Medical Physics (EFOMP), which comprises EC Member States and some other European countries, has defined a policy on training of qualified experts in this area. This policy addresses in broad outline their pre-entry qualification, formal vocational training and practical experience and envisages that national authorities will provide for assessment of competence and certification of qualified experts. It does not go as far as stating the reverse, i.e. that only certificate holders should be permitted to practise. Nevertheless, the example of medical physics in the sense of harmonisation of training standards is noteworthy. The system described in this paper could be extended, under the auspices of the IPSM, to cover patient protection (if the Health Departments considered it appropriate).

THE RADIATION PROTECTION PROFESSION

19. In considering whether or not qualified experts should be regarded as a regulated profession, it may be significant that specialists in radiation protection comprise only a relatively small proportion of the membership of SRP and IPSM (the combined membership is well over 2000, of which about 15% hold certificates of competence - see paragraph 7). The remainder of their membership includes scientists/engineers engaged in various activities, eg radiation physics, bioengineering, assessments and research.

20. The sheer diversity of these activities is sufficient reason to suggest that radiation protection in itself could not be regarded as a regulated profession. However, this would not necessarily prejudice a subset of the profession, namely radiation protection advisers (and other qualified experts - see paragraphs 21 and 22) being treated or established as a regulated profession.

OTHER ROLES OF QUALIFIED EXPERTS

21. IRR 85 identify two other roles for qualified experts. These are to carry out examinations and tests of monitoring equipment, under Regulation 24, and to carry out critical examinations of articles being erected or installed for use at work, under Regulation 32. In both these cases individuals may be appointed by employers exclusively for the tasks concerned, (qualified persons in these circumstances are often technicians or installation engineers acting also as RPA, having been specially trained for that task) with none of the wider range of duties generally associated with radiation protection advisers. Regulation 24 recognises the difference by referring to a "qualified person" rather than an RPA.

CONCLUSION

22. RPAs with very limited and specialised functions would be unlikely to qualify under the joint SRP/IPSM certification scheme and could hardly be regarded as belonging to a regulated profession. If a stricter general procedure for recognising the suitability of RPAs were to be developed for forthcoming legislation, it is debatable whether it should apply in all cases or whether it would remain appropriate to allow narrowly based appointments in certain circumstances, with the consequent diversity of treatment. RPAs from the UK might have difficulty in

practising at equivalent levels in other EC Member States without further demonstration of suitability.

OPTIONS

23. The three options mentioned in this paper are illustrative rather than exhaustive, but probably represent the range of possibilities. Commentators may wish to suggest others.

Option A Do nothing

i.e. leave the regulatory position unchanged.

Advantages This option requires no action and recognises that the present system appears to work satisfactorily.

Disadvantages UK compliance with the relevant requirements of the Basic Safety Standards Directive is less easily demonstrated. The free movement of UK RPAs within Europe may be hindered. The UK will have no hand in setting any related standards internationally, although at present there is no compulsion to accept qualifications that are recognised by other Member States.

Option B Define a minimum qualification to be directly demonstrated to the satisfaction of the regulatory authority

i.e. the regulatory authority would recognise qualifications based on certificates awarded, or examinations and courses set and arranged, by approved institutions with appropriate demonstration of competence.

Advantages Such a system would clearly meet all the European requirements, would give the regulatory authority a powerful position in any debate on harmonisation of European qualifications and training and could be adapted to recognise other Member States' systems.

Disadvantages This option might be seen as bureaucratic and/or as HSE interference in areas for which its expertise was limited. The resource implications for HSE might be considerable.

Option C Specify that a qualification should be demonstrated to the satisfaction of a recognised professional body.

Advantages This system would be nearer to self-regulation than the other options, is not fundamentally different from many other regulated professions (e.g. doctors, pharmacists and accountants) where the profession sets its own standards, and a good basis has already been established (the joint SRP/IPSM certification scheme). The burden on HSE resources should be minimal.

Disadvantages This option would need a change in the law to give substance to the proposal. There might be disagreement over the definition of "recognised professional bodies" and those excluded, for whatever reason, might feel aggrieved. The recognised professional bodies would face considerably increased demands on their resources.

INVITATION TO COMMENT

24. This paper is not intended to present a preferred solution but rather to stimulate discussion. Whatever future action is decided will need to be developed to take its place in the revision of IRR 85, in the mid 1990s, and to fit into a Europe of the Single Market from 1993. Comments, including, where appropriate, proposals for different courses of action, are invited. They should be sent to the address shown on the front cover by the date specified.

References

1 Council Directive of 15 July 1980 amending the Directives laying down the basic safety standards for the health protection of the general public and workers against the dangers of ionizing radiation, 80/836/Euratom, OJ L 246, Volume 23, 17 September 1980 (as amended by 84/467/Euratom).

2 The Ionising Radiations Regulations 1985, SI 1985 No. 1333, London: HMSO.

3 Approved Code of Practice, The protection of persons against ionising radiation arising from any work activity, The Ionising Radiations Regulations 1985, London: HMSO.

EXTRACTS FROM APPROVED CODE OF PRACTICE, PART 1 paragraphs 71 and 75

71 The qualifications, experience and qualities that a radiation protection adviser should possess should include, in so far as they relate to the scope of the advice required of him:

(a) such theoretical training as would ensure that he has the necessary knowledge of the properties of the ionising radiations used in the work undertaken by the employer;

(b) a thorough knowledge of the hazards of the ionising radiations present and how the hazard should be controlled and minimised;

(c) an understanding and detailed knowledge of the working practices used in the establishment to which he is being appointed, as well as a general knowledge of the working practices in other establishments of the same type;

(d) a detailed working knowledge of all statutory provisions, approved codes of practice, other codes of practice, guidance material and other information relevant to his work in giving advice in connection with the work with ionising radiation undertaken by the employer;

(e) the ability to give advice so that the employer can do what is required of him by statute and follow good radiation protection practice;

(f) the calibre and personality to enable him to communicate with the employees working or involved with the work with ionising radiation and with their representatives;

(g) the ability to keep himself up to date with developments in the use of ionising radiation in the field in which he gives advice, and with developments in radiation protection;

(h) an awareness of legislation, other than that in (d) above, and practices which could affect the work with ionising radiation on which he is expected to give advice;

(i) an appreciation of his own limitations, whether of knowledge, experience, facilities or resources, etc."

75 When an employer has appointed a radiation protection adviser for the purposes of the Regulations, i.e. the giving of advice, he should consult that RPA about matters that require his expertise, which include:

(a) restriction of exposure and maintenance of engineering controls and other equipment provided for such restriction;

(b) identification of controlled and supervised areas;

(c) control of access to controlled areas;

(d) dosimetry and monitoring;

(e) drawing up written systems of work and local rules;

(f) selection of radiation protection supervisors;

(g) investigation of abnormally high exposures or overexposures;

(h) training;

(i) deciding whether it is feasible to restrict the exposure of female employees to a reasonably uniform rate;

(j) hazard assessment and contingency arrangements;

(k) prior examination of any plans for new plant or new premises or modifications to existing plant or premises from a radiation protection aspect;

(l) other aspects of radiation protection that apply to work with ionising radiation carried on by that employer."

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Appendix 2

SOCIETY FOR RADIOLOGICAL PROTECTION

CERTIFICATE OF COMPETENCE IN APPLIED PHYSICS
CODE OF PROFESSIONAL CONDUCT

The following Code of Practice is provided for the guidance of members under the above scheme:

(1) You should at all times discharge your professional responsibility with integrity and in such a manner as to uphold the dignity and reputation of the health physics profession. In particular when acting in the capacity of a Radiation Protection Adviser to a client or to your employer, you shall, to the best of your ability, give objective advice based on sound and recognised health physics principles and should not allow any possible self interest or any possible management pressures to progress the work or process in question to affect your judgement or the advice given.

(2) You should satisfy yourself as to the extent of the professional duties required of you in any particular case and, if in any doubt, should obtain such clarification or confirmation as is necessary to satisfy yourself as to their extent before entering upon them. You should not accept professional obligations that you do not believe yourself competent to discharge.

(3) You should inform your client or employer in writing of any conflict between your personal interest and that of faithful service to your client or employer. If you hold a full time post (not subject to consultancy rules laid down by your employer) you should not undertake any consultancy work which might be prejudicial to the interests of your employer.

(4) You should, whenever called to do so in your professional capacity, give an opinion that is to the best of your ability both reliable and objective. When your professional advice is not accepted, you are advised to take all reasonable steps to ensure that the person overruling or neglecting your advice is aware of any danger

or breaches of statutory regulations which you believe may result from such overruling or neglect.

(5) When acting as a consultant, you should not attempt to supplant another consultant. If engaged to give a second opinion, you should confine yourself to an objective assessment of the problem and the evidence.

(6) You should not improperly disclose any information concerning the business of a client or employer past or present.

(7) You should not accept in connection with your professional work for a client or employer any remuneration, discount, allowance, gift or indirect profit from a third party without the written consent of your client or employer.

(8) Your remuneration for consultancy work should be limited to your agreed fees and reimbursement of out-of-pocket expenses.

(9) When advertising your services you should limit yourself to approved types of advertising. Public advertising, such as press or poster exhibits, should comply with the rules contained in the British Code of Advertising Practice. Private advertising should adopt similar principles and in general should be factual, honest and designed so as not to mislead.

(10) You shall not maliciously or recklessly injure or attempt to injure, whether directly or indirectly, the professional or personal reputation, business or prospects of another. Neither shall you use the advantages of any position which you may hold to compete unfairly with others.

(11) You should not be the medium of payments made on your client's or employer's behalf unless so requested by your client or employer, nor should you in connection with work on which you are employed placed contracts or orders except with the authority of your client or employer. You are advised to obtain such requests and/or authority in writing.

(12) You should be prepared to give such assistance as you may reasonably be able to give to further the education and

training of candidates for the profession of Health Physics.

(13) If you are engaged in work in a country other than the UK you should order your conduct accordingly to these rules insofar as they are applicable, but where there are recognised standards of professional conduct in the other country, you shall adhere to them also.

(14) In your professional capacity in peacetime, you shall not do anything or permit anything under your authority to be done the probable and involuntary consequence of which in your judgement would endanger human life, subject persons to unnecessary risk, expose valuable property to the risk of destruction, serious damage or contamination, or significantly pollute the environment, except where this is in the national or public interest.

(15) If you have been adjudicated bankrupt or convicted of a criminal or civil offence or are in other respects guilty of improper conduct, such as may render you unfit to retain Certification or to remain a Member of the Society or both, the facts shall be considered by Council who may determine that continuance of Certification or Membership or both is prejudicial to the interests of the Society.

Appendix 3

PRACTICES IN OTHER EC MEMBER STATES

BELGIUM

Summary - flexible system, recognising 3 or 4 categories of experts and incorporating a renewable licence.

Detail

1 Class 1 qualified experts inspect class 1 establishments, e.g. nuclear reactors, fuel reprocessing plants, or facilities with more than half of a critical mass (physical inspections require the inclusion of at least one class 1 expert). Monitoring is carried out by an organisation comprising only class 1 experts who, generally, must be Belgian (but exceptions are allowed). Experts should possess a diploma - such as in engineering or be practising nuclear physicists or engineers with an additional diploma or relevant knowledge; there is apparently plenty of flexibility built into the system. Satisfactory experience (undefined, but a minimum of 3 years in radiation protection practice) is required. Licences may be time limited, generally 6 years (renewable), and are limited to the particular facility (usually the one where the individual was trained).

2 Experts in categories other than Class 1 are subject to a similar system, but at a lower level.

DENMARK

Summary - no specific requirements or formal procedure, qualifications are assessed on a case-by-case basis, relevant theoretical training and practical experience are required.

Detail

Supervisors of X-ray installations (qualified experts) in the medical X-ray field should be approved by the National Institute of Radiation Hygiene of the National Board of Health; that approval will only be granted if the Institute judges the person to have the necessary training and experience in the field of X-ray installation management and radiation hazards, etc. The same situation applies in all other fields.

FRANCE

Summary - like UK, does not treat as a regulated profession. The related training is regulated but the position of qualified expert is seen as a job, not a profession.

Detail

1 There are two decrees relating to the regulation of the training of qualified experts in radiation protection:

(a) specifying the training of the "qualified person in radiation protection"; and

(b) determining the conditions governing the approval of organisations entitled to provide training in radiation protection for qualified persons.

The effect of the training programme is seen as such that "While the designation "qualified person" does not imply the possession of any diploma, academic qualification or university degree, a qualified person should be considered as having a general level of scientific and technical training equivalent to that required for the baccalaureat examination.". Successful training culminates in an examination followed by issue of a training certificate. The length of training depends on the qualifications already held. Employers are required to ensure that the knowledge of their qualified persons is kept up to date.

2 There is no similar regulation of training in other fields of occupational hygiene.

GERMANY

Summary - has legal guidelines on expertise in radiation protection in general, also in medicine and in nuclear facilities, plus a catalogue of learning objectives.

Detail

1 Guidelines concerning specialist knowledge in the area of radiation protection breaks the knowledge into 8 groups, further sub-divided within themselves:

(1) Notifiable handling of low activity radioactive substances;

(2) Handling of sealed radioactive substances not covered by (1);

(3) Handling of sealed radioactive substances for non-destructive material testing;

(4) Handling of unsealed radioactive substances and operation of nuclear installations;

(5) Employment of own staff as occupationally exposed persons in other peoples' plant;

(6) Notifiable use, storage and operation of type-approved devices and X-ray units in schools;

(7) Construction and operation of plants for producing ionising radiation;

(8) Prospecting, mining and processing of radioactive substances.

2 Requirements for practical professional experience (in years) are quoted for the various specialist knowledge groups, for different levels of professional education or training, and course contents are specified. An instruction leaflet has been produced for specialist knowledge groups 1.1 and 1.2.

3 There are also guidelines for verification of the competence of nuclear power station personnel, which vary according to the task/status of the person and, to some extent, the status of the plant. Examination procedures, scope and content are specified and there is a requirement for the specialist knowledge to be kept up to date: for some plant, technical and section managers the arrangements for maintaining specialist knowledge must be documented and presented to the competent supervisory authority at 3 year intervals.

4 There is a separate guideline for the requirements for maintaining the specialist knowledge of accountable shift personnel.

GREECE

Summary - activity so far confined to the medical field, suitability being decided by examination and licensing, though new requirements will provide for various categories of qualified experts who will be subject to approval by the Greek Atomic Energy Commission.

Detail

18 months regulated training at graduate level (equivalent to a Master's degree) in medical physics and radiation, followed by an examination to become authorised to work in a hospital. Individuals trained abroad must take the Greek examination to become authorised.

IRELAND

Summary - similar to UK, i.e. no formal system.

Detail

Training is considered on an ad hoc basis, generally no formalised training courses.

ITALY

Summary - has a register of qualified experts, who must have passed an examination tailored to the type of radioactive source involved.

Detail

Three levels of recognition:

(a) medical - use of X-rays;

(b) sources (i.e. all the rest except (c); and

(c) nuclear facilities.

Basic requirement (now under revision) is knowledge of radiation protection (for which there are special courses). Grades 1 and 2 can be secondary school/technical diploma standard, but Grade 3 must be graduates (engineering/physics/chemistry degrees). All take an oral examination of 15-20 minutes. The examining body is a Commission of 6 persons, chaired by the Chief Inspector of Factories with members comprising representatives of medical industrial interests, etc. Certificates are valid for 5 years, renewable if the holder's recent experience is relevant and up to date.

LUXEMBOURG

No information.

NETHERLANDS

Summary - several levels of government-recognised radiological expertise.

Detail

1 Persons who have attended special training courses and have passed the examination can be recognised as qualified persons within the context of a particular licence for specified radiological activities (all practices with sources of ionising radiation are subject to a system of licensing by government authorities, with certain exemptions). Government agencies within the Department of Environment and the Department of Social Affairs hold an official list of suitably qualified candidates. There is no regulation or defined policy regarding the period of validity of qualification in radiation protection expertise (i.e. no renewal of certification or review of competence).

2 There are official guidelines for the approval of training courses for qualified persons, published in 1984. Education and training in specialised courses on radiation protection can be officially approved at five different levels of expertise:

Level 5A: expertise in the use of sealed sources and X-ray generators, both at a low-risk level.

Level 5B: expertise in the use of sealed sources and unsealed radioactive substances at a low-risk level.

Level 4A: expertise in the use of all X-ray generators and the use of sealed sources as well as other radiation generating machines at an intermediate-risk level.

Level 4B: expertise in the use of sealed sources and unsealed radioactive substances at an intermediate-risk level.

Level 3: expertise related to the use of all sealed sources and unsealed radioactive substances at so-called "Class C" radionuclide laboratories.

Level 2: considerably greater expertise than is required for Level 3 with regard to the use of all sealed sources and unsealed radioactive substances in laboratories, as well as the use of all machinery and installations which generate ionising radiation.

Level 1: professional expertise in radiation protection at an internationally recognised level.

3 All courses must include practical training for approximately 20% of the total duration of the course. Only persons with wide experience in radiation protection practice can be admitted to Level 2 training courses. Examinations in all courses take the form of a written exam, nationally co-ordinated and carried out under the supervision of examiners nominated by the national authorities.

4 Training courses at the various levels can be summarised as below:

Level	**Duration (in weeks)**	**Preliminary Education and Training**
5	1	secondary technical/laboratory school
4	3	college of technology or advanced education
3	5	equivalent of Batchelor's Degree in Science, Medicine or Biology - (B.Sc. (Ord))
2	20	equivalent of Master of Science (M.Sc.) plus 3 years' experience in radiation protection (Post Graduate)

PORTUGAL

Summary - no specific requirements, decided case-by-case.

Detail

Responsibility for recognising the training is given to the National Commission for Radiation Protection, but no specific requirements - job based training plus short courses for some areas. Criteria for suitability is physics/engineering/medical degree plus a training course or on-the-job training in radiation protection.

SPAIN

Summary - fairly tough certification system.

Detail

All heads of radiation protection services must be certificated, via written and oral examinations. Certificates are issued by the Nuclear Safety Board, a governmental body responsible directly to Parliament.